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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 10

Application Number: 09/456,211
Filing Date: December 07, 1999
Appellant(s): ARMSTRONG ET AL.

MAILED

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Technology Center 2100

Scott A. Stinebruner – Reg. No. 38,323
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 6/26/03.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The brief does not contain a statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief. Therefore, it is presumed that there are none. The Board, however, may exercise its discretion to require an explicit statement as to the existence of any related appeals and interferences.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

No amendment after final has been filed.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of a first group of claims 1-2, 9-16, and 20-29, and a second group of claims 3-8, and 17-19, stand or fall together because appellant's brief does not give reasons in support of the statement that the claims do not stand or fall together as required. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,644,786	Gallagher et al.	7-1997
5,931,912	Wu et al.	8-1999

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-2, 9-16, and 20-29 were rejected under 35 U.S.C. 103(a). This rejection is set forth in prior Office Action, Paper No. 7, as follows.

Claims 3-8, and 17-19 were rejected under 35 U.S.C. 103(a). This rejection is set forth in prior Office Action, Paper No. 7, as follows.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2, 9-16, and 20-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,644,786 to Gallagher et al. in view of the applicants admitted prior art (AAPA). With regards to claims 1, 2, 9, 10, and 12, the Gallagher et al. reference teaches the gathering of requests from a plurality of requestors (column 1, lines 19-22, and also Fig. 3), the motion of these requests from one queue to a second queue (column 4, lines 8-9), the sorting of a movable packet of requests by position (column 2, lines 8-12), and the issuing of the movable packet of requests (column 4, lines 1-3 and 8-9). Gallagher et al. also discloses that (column 1, line 26-32) a queue can be maintained by a system scheduler for each I/O devise of the system and that, "The order in which the process requests are stacked and executed may vary from the order in which the requests are received by the scheduler in order to make the most efficient use of the I/O device or to provide preferential scheduling of higher priority requests." Although it may be implied as one of several scheduling design options, Gallagher et al. fails to specifically teach the sorting of the requests by requesters. The AAPA (page 2, line 16-26) teaches a "scheduling algorithm, often referred to as a 'fair' algorithm, attempts to schedule requests in a round robin fashion according to the various identities of the requestors associated with the requests such that each requestor in a system is able to use the DASD 'fairly', and not unduly stall other requestors attempting to access the DASD."

With regards to claims 2 and 12, the reference also fails to teach the sorting by the position to take place in the second queue. It would have been obvious to one of ordinary skill in the art to combine the AAPA described fair algorithm with the two queue position sorting algorithm of Gallagher et al. to create a method which gathered access requests are sorted by requester to create a first ordered set, moved from a first queue to a second queue, sorted by relative position on a storage device to create a second ordered set, and issued and removed from a second cue in order to create a system which gives fair and efficient access to a storage device. It also would have been obvious to one of ordinary skill in the art that the sorting by position could take place in either the first queue or the second queue of the disclosed system of the Gallagher et al. reference without changing the system function in order to most efficiently schedule the highest priority requests.

Regarding claim 11, the Gallagher et al. reference discloses a number of elevator sorting methods, and that schedulers may stack and execute requests in a way that varies from the way in which they are received to provide preferential scheduling according to prioritizing methods. While the fair scheduling method is not disclosed by the reference, it is disclosed by the AAPA to be well known in the art at the time of invention. It would have been obvious to one of ordinary skill in the art at the time of invention to sort using one of two well known methods, the fair method and the elevator method, and to then sort by the other of the methods in order to give a desired priority to certain requests according to the position and the requestor associated with the request.

Regarding claim 13, the Gallagher et al. reference discloses (Fig. 3) a memory, as part of a central processing unit, and a program resident on this memory. The program is disclosed to

meet the limitations of sorting of the plurality of access requests by position and the issuing of the sorted requests, but fails to specifically disclose the sorting of the requests by requestor. It would have been obvious to one of ordinary skill in the art, at the time of invention to combine the implementation of a fair requestor sorting method in order to provide more efficient disposal of all tasks (column 1, line 23-32), with the rest of the disclosed invention of Gallagher et al.

Regarding claims 14 and 15, the Gallagher et al. reference discloses that the scheduler may vary the way that the requests are executed from the way they are gathered, the sorting of these first set of requests by position to create a second ordered set, and the issuing of the requests from the second set. The reference fails to teach that the gathered requests should be sorted with the well-known fair algorithm, but does teach that sorting to give preferential scheduling may first occur (column 1, line 26-32) to give a higher priority to certain requests. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the well known fair algorithm with the invention of Gallagher et al. in order to fashion a system which provides for scheduling of the highest priority request of each requestor to be read in a sequential manner according to the respective positions to the requests.

With regards to claim 16, the Gallagher et al. reference teaches the gathering of requests from a plurality of requestors (column 1, lines 19-22, and also Fig. 3), the motion of these requests from one queue to a second queue (column 4, lines 8-9), the sorting of a movable packet of requests by position (column 2, lines 8-12), and the issuing of the movable packet of requests (column 4, lines 1-3 and 8-9). Gallagher et al. fails to specifically teach the sorting of the requests by requesters. The AAPA discloses (column 2, line 15-26) that a "scheduling algorithm, often referred to as a 'fair' algorithm, attempts to schedule requests in a round robin

fashion according to the various identities of the requestors associated with the requests such that each requestor in a system is able to use the DASD 'fairly', and not unduly stall other requestors attempting to access the DASD." The reference also fails to teach the sorting by the position to take place in the second queue.

It would have been obvious to one of ordinary skill in the art to combine the AAPA described fair algorithm with the two queue position sorting algorithm of Gallagher et al. to create a method which gathered access requests are sorted by requester to create a first ordered set, moved from a first queue to a second queue, sorted by relative position on a storage device to create a second ordered set, and issued and removed from a second cue, to give rise to a system which could give fairly and efficiently schedule access requests according to known methods. It also would have been obvious to one of ordinary skill in the art that the sorting by position could take place in either the first queue or the second queue of the disclosed system of the Gallagher et al. reference without changing the system function.

With regards to claim 20, the Gallagher et al. reference discloses the reversing of the queue direction (column 2, line 34-35) whenever an end is encountered.

With regards to claim 21, the Gallagher et al. reference discloses the reversing the sorting direction in ascending/descending order (column 2, lines 8-12 and 39-44) to create the well-known elevator type schedule for access to the DASD.

With regards to claim 22, the Gallagher et al. reference teaches that a plurality of jobs or processors may make access requests and that the access requestors are computer tasks executing on the computer (column 1, line 8-22).

With regards to claim 23, the Gallagher et al. reference discloses a system for processing access requests, having two queues, a first queue for gathering (column 4, lines 1-3), a second queue for issuing (column 4, line 8-9), and the sorting by position method in one of the queues (column 3, line 12-15). The reference fails to teach the sorting by requestor in the first queue, but does cites the possibility of variance in order of execution of requests (column 1, line 26-32) to preferentially treat requests.

It would have been obvious to one of ordinary skill in the art at the time of invention, that the well known fair scheduling algorithm could be added into the system design in order to give fair access to storage device. It also would have been obvious to one of ordinary skill in the art that the sorting by position could take place in either the first queue or the second queue of the disclosed system of the Gallagher et al. reference without changing the system function. The Gallagher et al. reference also fails to disclose that control logic is responsible for the movement of access requests from one queue to the other. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that since the queues are connected only through the disk driver (Fig. 3), it is inherent that there is control logic for queue to queue motion as part of the disk driver program.

With regards to claim 24, Gallagher et al. reference fails to teach the apparatus to further compromise a memory, and a processor coupled to the memory, where the processing program including control logic resident in the memory. However, it would have been obvious to one of ordinary skill in the art that Gallagher et al. does inherently include these limitations the drawing Figure 3. This figure shows a disk driver program located 320 on a CPU 301. It is therefore inherent to the Gallagher et al. disclosure that this program, including the control logic for

motion between the attached queues, is located is located in a memory which is coupled to a processor inside the CPU 301.

With regards to claim 25, Gallagher et al. reference fails to teach the apparatus to further compromise an operating system, and a processing system including two queues located in the operating system. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gallagher et al. does inherently include these limitations the drawing Figure 3. This figure shows a disk driver program 320, and two queues 321 and 323 located on a CPU 301. It is therefore inherent to the Gallagher et al. disclosure that this program, including the queues, is located is located in an operating system, located in a memory which is inside the CPU 301.

With regards to claim 26, Gallagher et al. reference teaches that the apparatus includes a disk driver program that interfaces with the DASD. The reference fails to teach that the disk driver program is resident in an operating system and that the queues are resident in the disk driver. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gallagher et al. does inherently include these limitations the drawing Figure 3. The disk driver program 320 is located on the CPU 301, and is therefore inherently located in the operating system that controls it. The queues are shown to be connected to the disk driver program 320 on the CPU 301, and it is therefore inherent that they are a part of the program.

With regards to claim 27, Gallagher et al. reference teaches that the queues are in the CPU 301. The reference fails to teach that the queues are resident in the memory. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that

Gallagher et al. does inherently include these limitations the drawing Figure 3. The queues are located on the CPU 301, and are therefore inherently located in the memory of the CPU.

With regards to claim 28, the Gallagher et al. reference teaches that a plurality of requests gathered, sorted according the relative positions of the access requests, and issued to a DASD. The reference fails to teach that the gathered requests should be sorted with the well-known fair algorithm, but does teach that sorting to give preferential scheduling may first occur (column 1, line 26-32) to give a higher priority to certain requests. While a signal-bearing medium bearing the program is not explicitly disclosed, Gallagher et al. does inherently include this limitation the drawing Figure 3. This figure shows a disk driver program located 320 on a CPU 301. It is therefore inherent to the Gallagher et al. disclosure that this program is located in a signal bearing medium, in this case the CPU 301.

With regards to claim 29, the Gallagher et al. reference does not explicitly teach that the signal-bearing medium includes at least one of a recordable medium and a transmission medium. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gallagher et al. does inherently include these limitations the drawing Figure 3. The program in located on the CPU 301, and are therefore inherently located in a signal bearing medium includes at least one of a recordable medium and a transmission medium, as the CPU will have some included memory, a recordable medium, and the shown transmission paths along with other inherent transmission type mediums.

Claim 3-8 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,644,786 to Gallagher et al. and the AAPA, and in further view of U.S. Patent 5,931,912 to Wu et al. With regards to claim 3, the Wu et al. reference discloses the sorting by requestor to

include the attempt to match the new requestor with a requestor currently waiting to be processed (column 7, lines 19-24), that if a match is found the new request is placed with the other entries form the same requestor (column 6, line 67, through column 7, line 6), and that if no match is found a new entry is made (column 7, lines 26-31). While the system of Wu et al. is used to map access and usage requests, it is not done in a system to provide fair and efficient access to a drive. It is done in a system to allow the accesses to such a device to be analyzed. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention, to combine the requestor based sorting and grouping methods of Wu et al. with the well known fair algorithm and the disclosed scheduling system of Gallagher et al. in order to allow a fair algorithm to minimally search an entire queue for like requestor identifiers.

Claims 4 and 5 are dependent on the combination of the Gallagher et al. and the Wu et al. references. With regards to claim 4, it is not disclosed by Gallagher et al. that after the position queue sorting is accomplished and the packet is sent onto be executed, a new set of data is received to be sorted by position. However, it is inherent to the system that moves between all queues occur in such a manner that the process of gathering and issuing is continuous. It would have been obvious to one of ordinary skill in the art at the time of invention that the emptying of a queue is an indicator that it is ready to receive more requests for its assigned function. With regards to claim 5, it has been disclosed by the instant inventor that the well-known fair algorithm utilizes a round robin approach to scheduling access requests. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the fair method to develop the highest priority packets of requests to be sorted by position by the system disclosed by Gallagher in order to implement an efficient elevator scheduling system.

Regarding claim 6, the Gallagher et al. reference teaches the moving of access requests as a packet of requests (column 2, line 39-45) and the reversing of a sort order for the next packet (column 2, line 34-35).

Regarding claim 7, the Gallagher et al. reference teaches the alternating of position sorting orders to try to maximize the efficiency of a DASD (column 2, line 8-12 and 39-44).

Regarding claim 8, the Gallagher et al. reference teaches that a plurality of jobs or processors may make access requests and that the access requestors are computer tasks executing on the computer (column 1, line 8-22).

With regards to claim 17, the Wu et al. reference discloses the sorting by requestor to include the attempt to match the new requestor with a requestor currently waiting to be processed (column 7, lines 19-24), that if a match is found the new request is placed with the other entries form the same requestor (column 6, line 67, through column 7, line 6), and that if no match is found a new entry is made (column 7, lines 26-31). While the system of Wu et al. is used to map access and usage requests, it is not done in a system to provide fair and efficient access to a drive. It is done in a system to allow the accesses to such a device to be analyzed. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention, to combine the requestor based sorting and grouping methods of Wu et al. with the well known fair algorithm and the disclosed scheduling system of Gallagher et al.

With regards to claim 18, it is not disclosed by Gallagher et al. that after the position queue sorting is accomplished and the packet is sent onto be executed, a new set of data is received to be sorted by position. However, it is inherent to the system that moves between all queues occur in such a manner that the process of gathering and issuing is continuous. It would

have been obvious to one of ordinary skill in the art at the time of invention that the emptying of a queue is an indicator that it is ready to receive more requests for its assigned function, in order to facilitate good request flow.

With regards to claim 19, it has been disclosed by the instant inventor that the well-known fair algorithm utilizes a round robin approach to scheduling access requests. It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the fair method to develop the highest priority packets of requests to be sorted by position by the system disclosed by Gallagher, in order to allow fast and even processing of requests.

(11) Response to Argument

Appellant's arguments filed 6/26/2003 have been fully considered but they are not persuasive. The Appellant with regards to issues A and B makes separate arguments, and each argument is addressed below in a similar manner.

A. Claims 1-2, 9-16, and 20-29 were rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher et al. in view of Applicants' Admitted Prior Art (AAPA).

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

In response to appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Gallagher provides such a motivation (column 1, lines 26-32) when discussing the processing of requests, saying **"The order in which process requests are stacked and executed may vary from the order in which the requests are received by the scheduler in order to make efficient use of the I/O device or to provide preferential scheduling of higher priority requests."**

While admitting that the two methods of sorting access requests are known in the art (page 6, paragraph 2, Appeal Brief), Appellant has argued that the motivation presented by Gallagher does not specifically address fairness concerns in the reference algorithm. However, this is not what is required. It would have been obvious to one of ordinary skill in the art at the time of invention to combine the AAPA taught well-known fairness algorithm that provides preferential scheduling of the oldest request by each requestor with the scheduling system of Gallagher in order to provide preferential scheduling of the highest priority requests.

In response to appellant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, motivation is provided from the primary reference in order to provide objective evidence that one of ordinary skill in the art at the time of invention would have been able to combine the teachings of Gallagher and the AAPA. Although it must

be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning, so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the appellant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Appellant further expounds on the argument that the placing of requests into packets (page 7, paragraph 3, Appeal Brief) such that the highest priority requests are moved into the execution queue does not provide proper motivation for incorporation of a fairness algorithm with the conventional elevator algorithm taught by Gallagher. However, this argument is faulty in that it fails to recognize the full teachings of the AAPA as would be recognized by one of ordinary skill in the art.

One of ordinary skill in the art would recognize that the well-known fair algorithm places a higher priority on the oldest request from each requestor. By moving a packet of the oldest single request from each requestor, and thereby prioritizing the oldest requests, into a queue to be sorted by position, a combined fair elevator algorithm is created. The argument continues (page 7, paragraph 4, through page 8, paragraph 2, Appeal Brief) to develop the idea that the teachings can not be combined by proposing that the sorting methods would be out of order if combined with the teachings of Gallagher and therefore inoperable as taught by the Appellant.

In response to appellant's argument that sorting methods would be out of order if combined with the teachings of Gallagher, the test for obviousness is not whether the features of a secondary reference may be bodily substituted directly into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the

references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). As such, the appellant's argument fails to address the rejection as presented in the last paragraph of the final rejection. The rejection states that the sorting by position could be properly completed in either queue. One of ordinary skill in the art would recognize that the packets of prioritized oldest requests from each requestor could be moved into the first queue to be sorted by position. Alternatively, the sorting by requestor could be completed in the first queue, and the packet of request could be moved into a second queue to then be sorted by position, without changing the scope of the complete teachings in the prior art of record viewed properly together.

Claim 2 is not argued separately.

Claim 9 argues a lack of motivation as with claim 1, as argued above.

Claim 10 argues the ordering of the sorting of the sets, and with claim 1, as argued above.

Claim 11 is not argued separately.

Claim 12 argues a lack of motivation as with claim 1, as argued above.

Claim 13 argues a lack of motivation as with claim 1, as argued above.

Claim 14 is not argued separately.

Claim 15 argues the ordering of the sorting of the sets, and with claim 1, as argued above.

Claims 16 and 20-22 are not argued separately.

Claim 23 argues a lack of motivation as with claim 1, as argued above.

Claims 24-27 are not argued separately.

Claim 28 argues a lack of motivation as with claim 1, as argued above.

Claim 29 is not argued separately.

B. Claims 3-8, and 17-19 were rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher et al. in view of AAPA, in further view of Wu et al.

In response to appellant's argument that U.S. Patent 5,931,912 to Wu et al. is nonanalogous art, it has been held that a prior art reference must either be in the field of appellant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the appellant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Appellant has argued that the Wu reference has no relevance whatsoever to the subject matter of Claim 3. Wu teaches the sorting of accesses to a DASD by user, or requestor. This relates directly to the "fair" sorting algorithm taught by the AAPA, in that it solves the same problem of sorting by requestor identity. Appellant states that Wu is so irrelevant to both the technological field of endeavor and to the specific problem being addressed that Appellants believe that one of ordinary skill in the art would not look to Wu et al. to solve the problem addresses by claim 3.

The lack of relevance set forth the by Appellant is based on the idea that the access requests of the reference are divergently different than access requests to be sorted by the invention. However, the use of a communication network in Wu does not negate the fact that the requests are still requests for data in a DASD. It is within the knowledge of one of ordinary skill in the art that many requests to data are processed over some type of communications network, most often a local area network (LAN). The use of a LAN to access data does not change the nature of the request, but rather the location and address of the data. Furthermore, there is nothing in the claim language of claim 3, or any of the preceding claims which limits the

environment of the invention. One of ordinary skill in the art at the time of invention would have recognized the many uses of DASDs, including in networked environments, such as web servers and network attached storage.

Appellant also argues lack of relevance with regards to the problem being solved. Appellant states that a different solution is being presented to a different problem. However, the Appellant has misrepresented the problem being solved by the claim limitations. The AAPA has clearly taught that it was well known prior to the time of invention that a "fair" algorithm would sort access requests based on the identification of the requestor. In claim 3, the problem of how a sorting by requestor is resolved. Wu teaches such a sorting of requests based on requestors, including the steps of determining whether another access requests in the first queue is associated with the same requestor as the inbound request, if so storing the inbound request after the last access request associated with the same requestor, if not, storing the inbound request within the first queue based upon a requestor identifier identified therewith (Wu et al., column 6, line 67, through column 7, line 31). One of ordinary skill in the art at the time of invention would have been able to recognize that this sorting of access requests by requestor could be used as the method of sorting access requests by requestor needed to implement a fair algorithm, as taught by the AAPA.

Claims 4-8 are not argued separately.

Claim 17 argues a lack of relevance with regards to the Wu et al. reference, as with claim 3, as argued above.

Claims 18-19 are not argued separately.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Joshua D Schneider
August 18, 2003

Conferees
Kim Huynh and Tod Swann

QAS
TC 2100

KIM HUYNH
PRIMARY EXAMINER
8/19/03

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